PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Dry Filter-Type Air Cleaner with Safety Element

We, CATERPILLAR TRACTOR CO., a corporation organized and existing under the laws of the State of California, United States of America, of 800 Davis Street, San Leandro, State of California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to air cleaners of the type used for example on internal combustion engines and particularly to a dry filter-type cleaner with an auxiliary or safety element which serves in the event of rupture or other major failure of a main element to protect the engine against entrance of damaging particles through its air inlet.

Oil bath and cyclone-type air cleaners conventionally employed on certain types of internal combustion engines have disadvantages among which are excessive size and high cost of manufacture necessary to obtain the desired low restriction to air flow.

Air cleaners employing a dry porous substance such as commercially known resin impregnated cellulose filter media are recognized as highly desirable from the standpoint of cost as well as size, simplicity and ease of servicing. Such filter media are, however, fragile and subject to collapse, rupture or other failure which is apt to admit large quantities of air laden with abrasive substances to an engine without warning to the operator before serious engine damage has occurred.

Consideration has been given to the use of a second or safety filter disposed down stream of a main filter having relatively small surface area and acting only in the failure or absence of the main filter to protect the engine. Because of the fact that filter elements are necessarily removed and replaced in the field and often by persons untrained in maintenance procedures, the possibility of a safety or auxiliary filter being removed and omitted during reassembly of an air cleaner has been a deterrent to general acceptance of cleaners of this kind.

It is, therefore, an object of this invention to provide an air cleaner with a dry porous-type filter unit and a second similar unit for emergency service only in which the second unit cannot be removed during ordinary field servicing of the cleaner.

Further objects and advantages of the invention reside in the construction and arrangement of the various components of the air cleaner and will become apparent upon an understanding of the following specification wherein reference is made to the accompanying drawing.

In the drawing:

Fig. 1 is a central vertical sectional view through an air cleaner constructed in accordance with the present invention;

Fig. 2 is a view in elevation with parts in section illustrating the adaptation of the same type of cleaner to a different type of engine where the cleaner occupies a different position; and

Fig. 3 is a fragmentary detail of a portion of the cleaner as viewed from the line III—III of Fig. 1.

In Fig. 1 of the drawing, the air cleaner is illustrated as contained in a housing 10 of generally cylindrical configuration which has a cover 11 secured in place thereon by a band 12 which circumscribes mating flanges on the housing and cover and is removably held in place as by a clamping screw 13 best shown in Fig. 3. The cover is provided with a central intake opening 14 communicating with a pre-cleaner illustrated at 15. This pre-cleaner designed to remove unusually large and heavy particles from the air is of conventional construction and does not form a part of the present invention. A main filter unit is disposed within the housing 10 and is bounded by two concentric perforated sheet metal cylinders shown at 16 and 17, the space between which is filled with a dry filter medium

18. This filter media may be of any commercially known type such as a resin impregnated fibrous cellulose material. The main filter unit has an imperforate top plate 19 and an imperforate bottom plate 20 of annular configuration.

Concentrically disposed within the main filter is an auxiliary filter unit also formed of concentric perforated sheet metal shells or cylinders 22 and 23 with a filter medium 24 similar or identical to the medium employed in the main unit. The top of the auxiliary unit is closed by a plate 25 and this plate has a centrally depressed area for the telescoping reception of a similar area in the top plate 19 of the main filter for holding the filters in concentrically spaced relationship at their upper ends. An annular flanged bottom plate secured as by spot welding or the like to the lower edges of the shells 22 and 23 is shown at 26.

Air entering the cleaner through the intake 14 is confined to the course illustrated by the arrows flowing downwardly between the filter housing and the main filter, then passing inwardly through both filters and finally out through the bottom of the auxiliary filter from which it enters the air intake manifold of an internal combustion engine or a transfer pipe as illustrated at 28 by which it is transmitted to such a manifold.

The main filter unit rests on a resilient gasket 29 at the bottom of the housing 10 and is pressed into sealing relationship therewith by a strap 30 which overlies the units and has perforated ends embracing threaded rods 32 welded to the inside of the housing 10. Wing nuts 33 are threaded on the rods to hold the assembly in place and urge the unit downwardly against the gasket 29. The bottom annulus 26 of the auxiliary filter unit is permanently secured as by welding or the like to an annular plate 35 and a plurality of cap screws 36 with nuts 37 thereon are also welded to the plate 35. These cap screws extend through the bottom of the housing 10 and also through suitable sealing gasket 38 on both sides of the bottom and their outer ends project through a flange 39 on the air intake pipe 28 so that the entire air cleaner is firmly secured in position with respect to the pipe when the nuts 37 are tightened.

With the assembly hereinabove described, ordinary servicing of the air cleaner is accomplished by removing the cover 11 and wing nuts 33 so that the main filter unit may be removed from the housing for inspection or replacement. Upon removal of the main unit, the auxiliary unit remains in place and cannot be removed from the housing which is firmly held in place by the relatively inaccessible nuts 37. It should be understood that the capacity of the main unit of the cleaner is such as to remove substantially all foreign matter from the air during operation of an engine and while the cleaned air passes through the auxiliary unit, it remains clean and need not be replaced in ordinary field inspection or replacement of the main unit. The auxiliary unit, however, occupies a position to filter the air in the event of a major failure of the main unit. Since its capacity is limited, it is subject to becoming clogged after a relatively brief period of operation when heavy smoke from the exhaust and poor engine performance indicates to the operator that the air cleaner is not performing satisfactorily and leads to the discovery that the main filter has failed. A further advantage of the fixed auxiliary filter which cannot be removed from the housing except when the air cleaner is completely removed from the engine is that it remains intact in the manner of a stand pipe when the main filter is removed preventing foreign objects or abrasive material from entering the intake manifold at this time.

A modified form of the invention is illustrated in Fig. 2 wherein the filter is shown in a position in which it may be used on a V-type engine. The position of one cylinder block of the V-type engine is indicated at 42 in broken lines and the intake manifold for this block is shown at 43. An ell-shaped fitting 44 forms a connection between the intake manifold and the cleaner which is inclined downwardly from a horizontal position having a removable cover illustrated at 45 and an air inlet 46 communicating with a precleaner 47. In this modification the air inlet enters directly through the side wall of the filter housing and the course of the air is otherwise the same as that described in connection with Fig. 1.

WHAT WE CLAIM IS:—

1. An air cleaner for an engine or the like comprising a housing with an air inlet and an air outlet, a filter unit disposed between the inlet and outlet, an auxiliary filter unit disposed between the first unit and the outlet, means to secure the cleaner to an engine for delivery of air through the outlet to the engine, said same means securing the auxiliary unit within the housing whereby the auxiliary unit can be removed only after removal of the housing from the engine, and means to remove the main unit from the housing while it is secured to the engine.

2. An air cleaner for an engine or the like comprising a housing with an inlet and an outlet, a hollow filter unit disposed in a position to surround the outlet and to intercept air flowing thereto, an auxiliary filter unit within the first unit and also surrounding the outlet, means to secure the auxiliary unit to the housing and the housing to an engine, and means to secure the first unit to the housing only, whereby it may be removed from the housing and auxiliary unit which are secured to the engine.

3. An air cleaner for an engine or the

like comprising a housing with an air inlet, an air outlet disposed centrally of one wall, an auxiliary air filter of generally tubular shape having a flange at one end, bolt means secured to said flange and arranged to extend through the housing and through an engine part for securing the housing and auxiliary unit thereto, a main filter unit surrounding the auxiliary unit in the housing, and means removably securing the main unit within the housing.

4. An air cleaner for an engine or the like comprising a housing with an air inlet and an air outlet, a filter unit disposed between the inlet and outlet, an auxiliary filter unit disposed between the first unit and the outlet, said auxiliary unit being fixed within the housing by means requiring mechanical aid for removal, and said first named unit being readily removable solely by hand.

5. An air cleaner substantially as hereinbefore described having reference to the accompanying drawings.

MARKS & CLERK.

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882647 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 3.

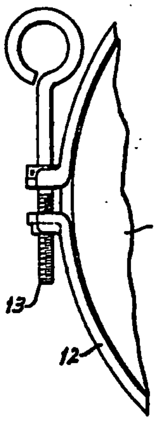

Fig. 1.

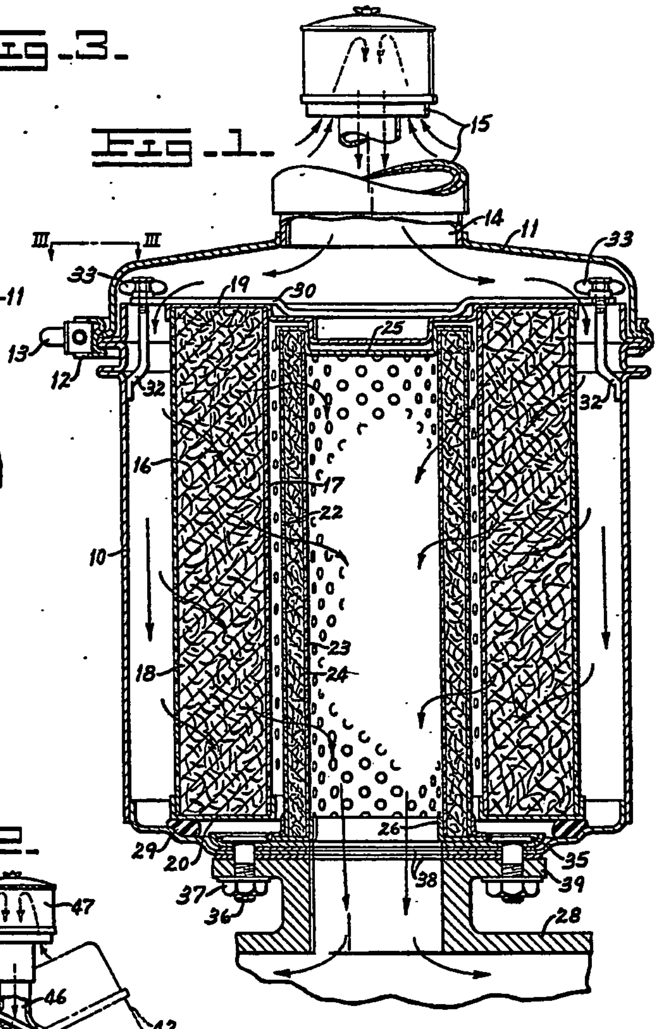

Fig. 2.